

Department of Physics & Astronomy

Research and Impact Strategy

About this document

This document will be updated annually taking into account personal research plans, research group strategies and changes to the research environment. It will feed into the MPS Research Strategy, informing the annual Integrated Planning and Budget Process (IPBP).

1. Our vision

Research is a key priority and fundamental to the **identity** of the Department. We will be **bold**, with the confidence to tackle research problems of globally-recognised significance. We will be **imaginative**, harnessing the rich and varied talents within the University and strong partnerships outside. We will be **focussed**, achieving high academic and socio-economic impact. We will be **coherent and collegial**, attracting, retaining and supporting highly-skilled staff.

2. Where we are now

Strengths

- Highly-engaged and research-active faculty
- Outstanding reputation in all our research areas
- Very strong international profile including influential positions in large collaborations
- High academic impact as measured for example by field-weighted citations
- Rapidly growing industry involvement including successful spinout companies
- Key partner in the regional South East Physics network (SEPnet)
- Strong and growing grant income with high research recovery rates
- Supportive environment in a research-intensive university known for interdisciplinarity

Weaknesses

- Traditional dependence on a limited number of funding streams (EPSRC, STFC, EU)
- Research grant income per FTE is smaller than departments with a larger experimental base
- Our research successes have not been promoted enough, especially with regard to student recruitment

Opportunities

- Growing collaborations between groups in the Department
- Attracting outstanding researchers through our policy on offering proleptic positions for long-term fellowships
- Further growth of our socio-economic impact by engaging in more challenge-driven research as driven by UKRI and government initiatives.
- Enhancing our engagement with industry partners
- Growing our research student base through new international partnerships

Threats

- UK's withdrawal from the EU poses ongoing threats to funding streams and our ability to recruit EU staff and students
- The School deficit, while largely caused by UG student numbers, limits our ability to invest in research initiatives
- The University's Size and Shape programme causes uncertainty and a reduction in expenditure is likely to impact on our ability to deliver research

3. Objectives

1. To produce research at the quality of the best universities in the world, with recognised world-leading activity in: Quantum Materials, Devices and Technologies; Particle Physics; and Astronomy/Cosmology.
2. To create research with substantial academic and socioeconomic impact.
3. To attract high levels of research funding via diversification.
4. To enhance our facilities and internal research support mechanisms in order to create a research environment that allows individuals and groups to excel in their research activities and further their careers.
5. To attract and retain the best researchers by creating a more diverse research workforce through our equality, diversity and inclusion strategies.
6. To enhance the attractiveness of our taught courses by leveraging our research excellence.

4. Key Performance Indicators

The KPIs linked to the six objectives are:

1. P&A to be ranked in the top 15 overall in the next REF with 60% of outputs assessed as 4* and to continue to outperform many of the world's leading universities in field-weighted citation indices.
2. At least three impact case studies graded as 4* in the next REF.
3. Total grant income increasing to the equivalent of £180k/FTE by 2025 with funding involving industrial partners increasing by 50% via Innovate UK and KTP-type grants.
4. Continuously improving staff survey results pertaining to research culture.
5. Improved diversity of our researchers and a flourishing doctoral cohort as measured by completion rates and destinations after graduation.
6. The successful launch of new courses linked to data science and quantum technologies that recruit well, surpassing University thresholds.

5. How we will get there

Our research divides broadly into “big science” around international astronomical and particle physics experiments and lab-based physics (i.e. quantum technology, photonics and materials physics), which require different strategies. These differences are considered in research strategies being developed within individual research groups. At the departmental level, our strategy for achieving each of the objectives and linked KPIs is detailed below.

1. We will achieve world-leading research in “big science” primarily by making clearly recognised contributions to major experiments (i.e. those that will make significant discoveries, e.g. Higgs Boson, cosmological parameters of the universe etc). We need our expertise to be specialised and

coordinated so that Sussex becomes a partner of choice and we will make use of our external research advisors in helping focus our efforts. Having a theory group that can make significant contributions to a global effort complementing and shaping these experiments is important. Agility here is key – being able to move to new promising areas as they present themselves will ensure we are part of the most relevant and topical discoveries.

We have a strong record of faculty taking on leadership roles in big collaborations and we will support such opportunities e.g. through sabbaticals, long-term leave, or flexible teaching arrangements. Involvement in significant experiments increasingly requires co-funded investment e.g. Sussex has contributed to the development of the International Linear Collider and 4MOST spectrograph for the European Southern Observatory, and we should continue to do so when strategically important. Our contributions focus around the computational (data analysis and modelling) and experimental (e.g. calibration devices) expertise, these could be enhanced with local (e.g. DISCUS) and regional (e.g. SEPnet) partnerships.

Our strategy for continuing to enhance research excellence in lab-based science involves growing national and international collaborations such as our key roles in the Quantum Technology Hubs; targeted investment e.g. through strategic development funding for research facilities; engagement with industry and strategic hires. Local academic coordination will be facilitated by the Sussex Quantum research programme.

2. Potential impact case studies will be identified early in the REF cycle by group heads and through the annual faculty personal research plans. These will be prioritised by the research strategy group with input for the Impact Lead and DRaKE. They will then be nurtured with e.g. workload remission, professional services support, and Impact Acceleration Account and School funding to help develop them. It is particularly important that evidence of impact for each potential case is gathered throughout the REF cycle. Time allocation in the workload model will also be considered for initiating new potential impact case studies. Impact will be an important consideration in sabbatical requests as well as strategic hires.

Impact in the lab-based sciences arises from the nature of the research but is enhanced through the significant opportunities for interdisciplinary research to explore applications as well as engagement with industry to commercialise outputs. We have had successful spin-offs already (AMD and Universal Quantum) and will target other potential for commercialisation. The quantum programme will help with this, but research centres at the University are currently under review and restructuring. It is important that we engage in this process to ensure that the structures that emerge support our ambitions for a strong and coordinated quantum effort that is widely recognised outside the University for its research excellence.

One significant impact of the big science comes through public engagement. Our public engagement programme has been effective at reaching large and diverse audiences with events ranging from an exhibition at the Science Museum in London to workshops in the developing world through the Physics without Frontiers initiative. The Outreach and Public Engagement Director and Officer are developing a strategy to optimise the impact of these activities and ensure that data and evidence is collected to support any potential impact case studies. Another impact from the big science may come through the applications of data science. This is emerging through individual case studies and strategic programmes such as the Data Intensive Science Centre in SEPnet, DISCnet – and is hoped to be enhanced through DISCUS.

Promoting our academic excellence is important for both delivering the science, but also for recognition in assessments leading to league tables, e.g. REF. We have created the post of Research Communications Officer for P&A, who is developing a strategy for a more coordinated approach to research communications.

3. The most significant opportunities for growth in research income are likely to be in the quantum and materials areas. We will focus our efforts on the most promising ones through group strategies and guided by advice from our ERAs. Increased engagement with industry will be a key part of our approach and we will develop new connections e.g. by running training through the RISE project to connect with local SMEs and engaging in the Hatch report findings on the prospects for the commercialisation of quantum research at Sussex.

Having a business development officer will be important in finding and exploiting these opportunities. There is a risk associated with this role being centralised and we will continue to push for its importance (along with other research support) for the Department to continue to grow its research income.

We will aim to improve success rates for grant applications through feeding into the MPS strategy on peer review and offering mock interviews for fellowship applications. RSG will be used in an advisory capacity about the strategic use of School funds for matched funding of grants and other research investments. As well as individual faculty applying for funding, we will take a coordinated approach to grant capture e.g. programme or network grants, which will be led by group and centre heads.

4. The research environment and culture will be supported by prioritising the provision of high-quality research facilities including the efficient allocation and use of space, investment in lab space such as through strategic development funds, and suitable provision of workshops and technicians. Efforts will be made to protect research time from administrative creep e.g. through sabbaticals and (where possible and appropriate) trying to structure teaching so that sustained research periods are possible. Research groups will be encouraged to embed project students in their activities to enhance their experience as well as the general research environment. Research successes should continue to be lauded at Departmental and School meetings and promoted widely across the campus and beyond. The Research Communications Officer can help coordinate this. Group heads and line managers will be encouraged to proactively put forward people for internal promotions and awards as well as external prizes.

5. Attracting and retaining outstanding researchers is key to our ongoing research success. We will engage with the Director of EDI to ensure our approach to research uses EDI best-practice. We aim to maintain our policy of offering proleptic positions to long-term fellowship holders in order to attract the best talent to Sussex. We also uphold the Concordat to Support the Career Development of Researchers and have created a Network for Early Career Researchers, with leadership from two junior researchers and one dedicated faculty, who will develop a strategy for coordinating mentoring, training and other opportunities to support the careers of junior research staff. PhD students are the lifeblood of much of our research and finding ways of enhancing this important part of the Department will be a priority. We will seek new ways of funding them e.g. through industry partnerships such as the SEPnet SME-DTN and will make use of the Doctoral School matched funding investment in PhD students. Targeting CDTs are an important part of our

strategy and applications could be supported with workload remission for those who coordinate them. We will continue to provide strong training through our membership of GRADnet.

6. Internal analysis from the portfolio review toolkit shows that our undergraduate courses score very highly by internal measures of quality, but score less well on market attractiveness. We aim to use our research strengths to improve our taught offering. This will involve working with the teaching and learning team to create new courses based on our research as well as promoting what we do and what we can offer. The Department already has approval to create an Online Distance Learning MSc in Quantum Technologies with Pearson, who carried out research and decided that there was a market for it. We are also looking into the potential for undergraduate courses in quantum technologies and data science. Promoting our research excellence to support the recruitment of undergraduate students will need coordination between the Research Communications Officer and the outreach and admissions teams.

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